CLAIMS

What is claimed is:

1. A vehicle gaseous fluid metering device comprising:

a housing, adapted for routing of gas from an input passage to an output passage;

a valve assembly positioned inside said housing for selectively moving gas from said input passage to said output passage, said valve assembly including at least one valve seat acting as an opening between said input passage and said output passage, and at least one valve member operative with said valve seat and acting as a moveable barrier between said input passage and said output passage, wherein said valve member moves between a closed position and an open position;

a valve shaft connected to said at least one valve member, said valve shaft is operable for moving said at least one valve member in response to rotation of said valve shaft; and

an actuator operable for rotating said valve shaft causing corresponding axial movement of said at least one valve member.

2. The vehicle gaseous fluid metering device of claim 1, wherein said at least one valve member radially rotates against said at least one valve seat to self-clean said at least one valve member and said at least one valve seat.

3. The vehicle gaseous fluid metering device of claim 2, wherein any fluid and substance on said at least one valve seat and said at least one valve member is sheared during the rotation of said at least one valve member.

4. The vehicle gaseous fluid metering valve of claim 2 wherein at least one valve member rotates from greater than 0 degrees to about 90 degrees prior to axial movement of said at least one valve member.

5. The vehicle gaseous fluid metering valve of claim 1 wherein said at least one valve member rotates over a range of 45 degrees to 120 degrees over the range of axial motion.

6. The vehicle gaseous fluid metering device of claim 1, wherein said actuator further comprises:

an engagement member extending from said valve shaft; and

a first ramped surface formed inside of said housing, wherein said member engages said first ramped surface during rotation of said valve shaft for moving said shaft in an axial direction in response to rotation of said valve shaft.

7. The vehicle gaseous fluid metering device of claim 6 wherein said engagement member is a pin extending from the valve shaft and said ramp portion is a first slot formed in a wall of the valve housing.

8. The vehicle gaseous fluid metering device of claim 7 wherein said first slot is progressively angled from a first angle at a valve seat breaking end of said slot to a second angle at a valve open end of said first slot.

9. The vehicle gaseous fluid metering device of claim 8 wherein said first slot has a first angle that is from about 0 to about 20 degrees and a second angle that is about from about 10 to about 80 degrees.

10. The vehicle gaseous fluid metering device of claim 9 wherein said first angle is from about 0 to about 10 degrees and second angle is from about 10 to about 60 degrees.

11. The vehicle gaseous fluid metering device of claim 10 wherein said first angle is from about 0 to about 10 degrees and said second angle is from about 20 to about 30 degrees.

12. The vehicle gaseous fluid metering device of claim 7 further comprising a first roller bearing disposed on a first end of said pin, wherein said first bearing engages said first slot for riding along the first slot during rotation of the valve shaft.

13. The vehicle gaseous fluid metering device of claim 12 wherein the rate of axial movement of said valve shaft between said open position and said closed position is a function of the degree of incline of said first slot.

14. The vehicle gaseous fluid metering device of claim 13 wherein said valve assembly includes a second connected valve member for seating on a second valve seat.

15. The vehicle gaseous fluid metering device of claim 14, further comprising:

a lost motion device for allowing one of said first valve member and said second valve member to reach a valve seat prior to the other of said valve member yet allowing the other of the valve member to close.

16. The vehicle gaseous fluid metering device of claim 15 wherein said lost motion device is a valve spring disposed on said shaft between said first valve member and said second valve member, wherein said second valve member is slidable along the longitudinal axis of said valve shaft to allow said valve spring to be compressed between said first valve member and said second vale member when said valve assembly is in said closed position.

17. The vehicle gaseous fluid metering device of claim 12 wherein said actuator turns said valve shaft by way of a mechanical linkage.

18. The vehicle gaseous fluid metering device of claim 17 wherein the mechanical linkage is a gear set, a chain drive, a belt drive or a lever.

19. The vehicle gaseous fluid metering device of claim 12 wherein said actuator further comprises a gear having a yoke portion for engaging said pin.

20. The vehicle gaseous fluid metering device of claim 19, further comprising:

a position sensor operably engaged to said gear, wherein said position sensor provides output based on the movement of said gear.

21. The vehicle gaseous fluid metering device of claim 19 further comprising a motor operably connected to said gear, wherein said motor is capable of rotating said gear.

22. The vehicle gaseous fluid metering device of claim 21, further comprising a torsion spring connected to said gear, wherein said torsion spring functions to move said valve assembly to said closed position when said motor is not action on said gear.

23. The vehicle gaseous fluid metering device of claim 19, wherein said actuator further comprises:

a second slot formed inside of said housing, wherein said second slot has a lower ramp surface and an upper ramp surface, wherein said pin extends laterally through said valve shaft, wherein a first end of said pin is slidably engaged in said first slot and a second end of said pin is slidably engaged in said second slot.

24. The vehicle gaseous fluid metering device of claim 23 wherein said valve assembly includes a second connected valve member for seating on a second valve seat.

25. A vehicle gaseous fluid metering device comprising:

a valve housing, said valve housing being adapted for routing of exhaust gas from an input passage to an output passage;

a valving assembly positioned inside said valve housing for selectively exhausting gas from said input passage to said output passage, said valving assembly including a first valve seat and a first valve member for sealing between said input passage and said output passage, and a second valve seat and a second valve member for sealing between said input passage and said output passage, wherein the amount of exhaust gas vented from said input passage to said output passage is the sum of the exhaust gas moving through said first valve member and said second valve member;

a valve shaft connected to said first valve member and said second valve member, wherein said valve shaft is configured to rotate and move said first

valve member and said second valve member between an open position and a closed position;

a motor operably associated with an electrical source, wherein said motor includes a motor shaft protruding into the inside of said valve housing, whereby said motor rotates said motor shaft;

a first gear connected to the end of said motor shaft;

a bore extending longitudinally inside of said valve housing between a first end of said valve housing and a second end of said valve housing;

a second gear disposed inside of said valve housing, wherein said second gear is engageable with said first gear and configured to rotate in the opposite direction of said first gear in response to the movement of said motor shaft, wherein said second gear extends across said bore and has a gear opening extending through said second gear; and

an actuator assembly contained inside said bore and configured to move said valve shaft between said open position and said closed position.

26. The vehicle gaseous fluid metering device of claim 25 further comprising:

a first slot and a second slot formed inside of said valve housing, wherein said first slot and said second slot have a lower ramp portion and an upper ramp portion; and

a pin extending laterally through said valve shaft, wherein a first end of said pin is slidably engaged to said first slot and a second end of said pin is slidably engaged to said second slot.

27. The vehicle gaseous fluid metering device of claim 26, wherein said first valve member and said second valve member each respectively rest against said first valve seat and said second valve seat when said valve assembly is in said closed position, and said first valve member and said second valve member are extended away from said first valve seat and said second valve seat when said valve assembly is in said open position.

28. The vehicle gaseous fluid metering device of claim 27, further comprising:

a guide shaft that has one end disposed inside of a gear opening in said second gear and a second end extending longitudinally inside of said bore away from said second gear whereby said guide shaft holds said second gear against said pin during rotation of said second gear.

29. The vehicle gaseous fluid metering device of claim 28, further comprising:

a set of two or more roller bearings positioned between said guide shaft and a side wall of said bore; and

a guide shaft bushing positioned between said guide shaft and said side wall of said bore, wherein said guide shaft bushing secures said second end of said guide shaft during rotation of said guide shaft, and a washer and clip engageable to said second end of said guide shaft.

30. A method of operating a vehicle gaseous fluid metering device comprising the steps of:

providing a valve housing positioned between an input passage and an output passage;

providing a valve assembly having at least one valve seat and at least one valve member;

providing a valve shaft;

providing a valve shaft configured to move in an axial direction in response to rotation about its axis, said valve shaft coupled to said at least one valve member for moving of the at least one valve member in response to rotation of the shaft; and

providing an actuator for rotating the valve shaft for moving the valve member in an axial direction in response to rotation of the valve shaft and rotating the valve shaft to provide corresponding axial movement of the valve member.

31. The method of claim 30 further comprising the step of:

opening said valve assembly by moving said valve shaft to an open position using said actuator assembly to simultaneously rotate and move said valve shaft in a longitudinal direction, whereby said at least one valve member moves to said open position by rotating and moving with said valve shaft away from said at least one valve seat.

32. The method of claim 31 further comprising the step of:

closing said valve assembly by moving said valve shaft to a closed position using said actuator assembly to rotate and move said valve shaft in a longitudinal direction, whereby said at least one valve member moves to said close position by rotation and moving with said valve shaft toward and subsequently seating against said at least one valve seat.

33. The method of claim 30 further comprising the step of:

self-cleaning said at least one valve member and said at least one valve seat by radially rotating at least one valve member against at least one valve seat during said opening and said closing of said valve assembly.

34. The method of claim 30 where said valve assembly has a first valve seat and a first valve member disposed on said valve shaft and operably engageable with said second valve seat, and a second valve seat and a second valve member disposed on said valve shaft and operably engageable with said second valve seat.

35. The method of claim 34 further comprising the steps of:

providing a valve spring disposed on said valve shaft between said first valve member and said second valve member, wherein said second valve member is slidable along the longitudinal axis of said valve shaft; and

maintaining said first valve member and said second valve member in the closed position by compressing said valve spring between said first valve member and said second valve member during said step of closing said valve assembly, wherein said second valve member abuts said second valve seat as said valve shaft moves in said longitudinal direction, wherein said valve shaft continues to slide through said second valve member once said second valve member abuts said second valve seat, wherein said valve spring is compressed when said first valve member contacts said valve spring and moves said valve spring toward said second valve member, wherein said valve spring is compressed between said second valve member and said first valve member.

36. The method of claim 30 wherein the steps of opening said valve assembly and closing said valve assembly, using said actuator assembly further comprises:

providing a first slot and a second slot formed inside said valve housing;

providing a pin perpendicularly disposed through an engagement hole that extends through said valve shaft, wherein a first end of said pin is slidably

engaged to said first slot and a second end of said pin is slidably engaged to said second slot;

providing a first roller bearing disposed on said first end of said pin, and a second roller bearing disposed on said second end of said pin; and

opening said valve assembly by rotating and moving said valve shaft in a longitudinal direction, wherein said pin, said first roller bearing slides along said first slot and said second roller bearing slides along said second slot to control the rotational and longitudinal movement of said valve shaft.

37. The method of claim 36, further comprising the steps of:

providing a position sensor affixed to said bore; and

sensing the position of said valve shaft by generating an output signal from said position sensor based on the movement of said guide shaft.